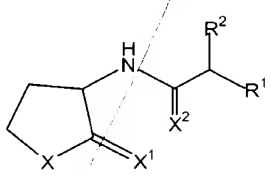
WHAT IS CLAIMED IS:

1. A compound having the structure:



(I)

wherein,

R^1 is a member selected from —H, —OH, and (=O);

R^2 is a member selected from H, reactive functional groups, alkyl groups terminally substituted with a reactive functional group and internally substituted alkyl groups terminally substituted with a reactive functional group;

X is a member selected from —O—, —S— and—NH—; and

X^1 and X^2 are members independently selected from O and S.

2. The compound according to claim **1**, wherein R^2 is an internally substituted alkyl group terminally substituted with a reactive functional group.

3. The compound according to claim **2**, wherein the alkyl group is internally substituted with a functional group that is a member selected from —OH, (=O) and combinations thereof.

4. The compound according to claim **1**, wherein the reactive functional group is a member selected from $—OR^3$, $—NHR^4$, $—COR^5$, —SH and $—CH_2X^3$

wherein,

$—OR^3$ is a member selected from hydroxy, alkyl sulfonate and aryl sulfonate groups;

R^4 is a member selected from H, C_1-C_6 alkyl, C_1-C_6 substituted alkyl, aryl and substituted aryl groups;

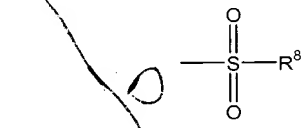
R^5 is a member selected from H, X^3 and $—OR^6$, wherein R^6 a member selected from alkyl, substituted alkyl, aryl, substituted aryl,

heteroaryl, substituted heteroaryl, heterocyclyl and substituted heterocyclyl groups; and

X^3 is a halogen.

5. The compound according to claim **1**, wherein the compound is a single stereoisomer.

6. The compound according to claim **4**, wherein R^3 is



(V)

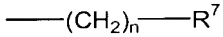
wherein,

R^8 is a member selected from alkyl, substituted alkyl, aryl and substituted aryl groups.

7. The compound according to claim **1**, wherein the alkyl and the internally substituted alkyl groups are members selected from C_1-C_{20} saturated straight-chain, C_1-C_{20} saturated branched-chain, C_1-C_{20} unsaturated straight-chain, C_1-C_{20} unsaturated branched-chain alkyl and internally substituted alkyl groups.

8. The compound according to claim **7**, wherein the alkyl and internally substituted alkyl groups are members selected from C_5-C_{10} saturated straight-chain, C_5-C_{10} saturated branched-chain, C_5-C_{10} unsaturated straight-chain, C_5-C_{10} unsaturated branched-chain alkyl and internally substituted alkyl groups.

9. A compound according to claim **1**, wherein R^2 has the structure:



(III)

wherein,

R^7 a reactive functional group; and

n is a number from 1 to 20, inclusive.

10. The compound according to claim **9**, wherein n is a number from 2 to 9, inclusive.

11. A compound according to claim **1**, wherein R^2 has the structure:

(IV)

wherein,

R^7 is a reactive functional group; and

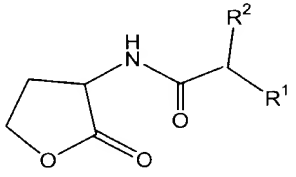
q and s are numbers independently selected from 1 to 20, inclusive.

12. The compound according to claim **11**, wherein s is a number from 2 to 9, inclusive.

13. A pharmaceutical formulation comprising a pharmaceutically acceptable carrier and a compound according to claim **1**, said reactive functional group of said compound being covalently bound to a biologically active agent.

14. The pharmaceutical formulation according to claim **13**, wherein said biologically active agent is a member selected from antibiotics, immune stimulators and combinations thereof.

15. A compound having the structure:



(II)

wherein,

R^1 is a member selected from H, OH, and (=O); and

R^2 is a member selected from H, reactive functional groups, alkyl groups terminally substituted with a reactive functional group and internally substituted alkyl groups terminally substituted with a reactive functional group, with the proviso that when R^2 is —OH, R^1 is a member selected from OH, and (=O).

16. The compound according to claim **15**, wherein the reactive functional group is a member selected from —OR^3, —NHR^4, —COR^5, SH and CH_2X^3 wherein,

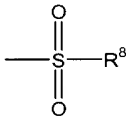
—OR^3 is a member selected from hydroxy, and a species such that —OR^3 is a leaving group;

R^4 is a member selected from H, C_1-C_6 alkyl, C_1-C_6 substituted alkyl, aryl and substituted aryl groups;

R^5 is a member selected from H, halogen and —OR^6, wherein R^6 is species such that —OR^6 is a leaving group; and

X^3 is a halogen.

17. The compound according to claim **16**, wherein R^3 is



(V)

wherein,

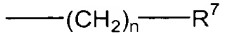
R^8 is a member selected from alkyl, substituted alkyl, aryl and substituted aryl groups.

18. The compound according to claim **16**, wherein R^6 is a member selected from alkyl, substituted alkyl, aryl, substituted aryl, heteroaryl, substituted heteroaryl, heterocyclyl and substituted heterocyclyl groups.

19. The compound according to claim **15**, wherein the alkyl and the internally substituted alkyl groups are members selected from C_1-C_{20} saturated straight-chain, C_1-C_{20} saturated branched-chain, C_1-C_{20} unsaturated straight-chain, C_1-C_{20} unsaturated branched-chain alkyl and internally substituted alkyl groups.

20. The compound according to claim **19**, wherein the alkyl and internally substituted alkyl groups are members selected from C_5-C_{10} saturated straight-chain, C_5-C_{10} saturated branched-chain, C_5-C_{10} unsaturated straight-chain, C_5-C_{10} unsaturated branched-chain alkyl and internally substituted alkyl groups.

21. A compound according to claim **15**, wherein R^2 has the structure:



(III)

wherein,

R^7 is a reactive functional group; and

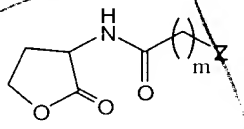
n is a number from 1 to 20, inclusive.

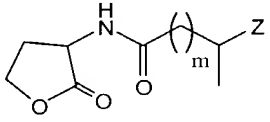
22. The compound according to claim **21**, wherein n is a number from 2 to 9, inclusive.

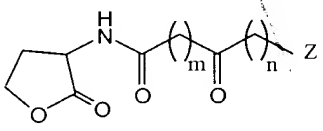
23. The compound according to claim **15**, wherein R^2 is a member selected from the group consisting of—COOH, —OH, —NH_2, and —SH.

24. The compound according to claim **21**, wherein R^7 is a member selected from the group consisting of—COOH, —OH, —NH_2, and —SH.

25. A compound having a structure that is a member selected from:



;




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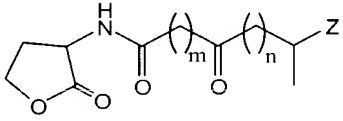
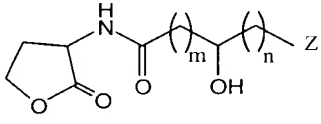
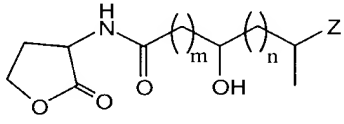




and


wherein,

m is a number selected from 1 to 20, inclusive;

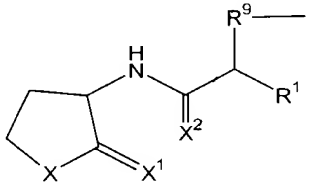
n is a number from 0 to 20, inclusive; and

Z is a reactive functional group.

26. The compound according to claim **25**, wherein m and n are numbers independently selected from 2 to 9, inclusive.

27. The compound according to claim **25**, wherein Z is a member selected from —NH_2, —COOH, —SH, and —OH.

28. An immobilized compound comprising a solid support to which is attached a molecule comprising the structure:



(VI)

wherein,

R^1 is a member selected from —H, —OH, and (=O);

R^9 is a member selected from alkyl groups and substituted alkyl groups;

X is a member selected from —O—, —S— and —NH—;

X^1 and X^2 are members independently selected from O and S.

29. The immobilized compound according to claim **28**, wherein the solid support is a member selected from beads, particles, membranes, substantially planar surfaces and combinations thereof.

30. The immobilized compound according to claim **28**, wherein the solid support comprises a member selected from silica, metal, plastic and combinations thereof

31. The immobilized compound according to claim **28**, wherein R^9 comprises a spacer moiety situated between the molecule and the solid support.

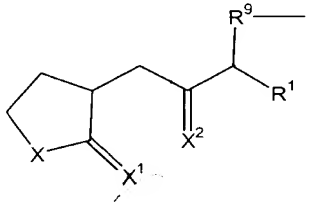
32. The immobilized compound according to claim **31**, wherein the spacer moiety is selected from C_6-C_{30} alkyl groups, C_6-C_{30} substituted alkyl groups, polyols, polyethers, polyamines, polyamino acids, polysaccharides and combinations thereof.

33. The immobilized compound according to claim **31**, wherein the spacer moiety comprises a cleavable moiety.

34. The immobilized compound according to claim **33**, wherein the cleavable moiety is cleaved by a member selected from light, heat, oxidation, reduction, enzymatic action, hydrolysis and combinations thereof.

35. The immobilized compound according to claim **34**, wherein the cleavable moiety is a member selected from disulfides and esters.

36. A method for isolating a microbial receptor binding to a molecule comprising the formula:



(VI)

wherein,

R^1 is a member selected from —H, —OH, and (=O);

R^9 is a member selected from alkyl groups and substituted alkyl groups;

X is a member selected from —O—, —S— and—NH—;

X^1 and X^2 are members independently selected from O and S;

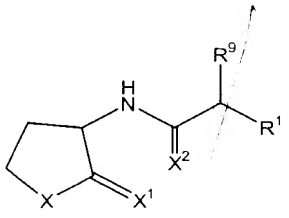
the method comprising:

contacting a microbial preparation comprising the receptor with the immobilized compound according to claim **28**, thereby forming a complex between the receptor and the immobilized compound.

37. The method according to claim **36**, further comprising separating the complex from components of the microbial preparation not comprising the receptor.

38. The method according to claim **37**, further comprising disrupting the complex between the immobilized compound and the receptor, thereby separating the receptor from the immobilized compound.

39. An immunogenic conjugate comprising a target component comprising the structure:



(IX)

wherein,

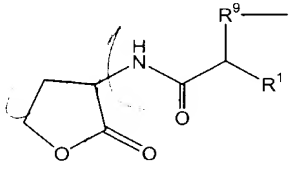
R^1 is a member selected from —H, —OH, and (=O);

R^9 is a member selected from alkyl groups and substituted alkyl groups;

X is a member selected from —O—, —S— and —NH—; and

X^1 and X^2 are members independently selected from O and S.

40. The immunogenic conjugate according to claim **39**, wherein the target component comprises the structure:



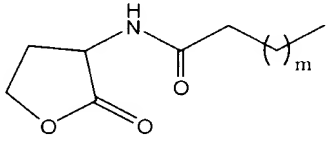
(X)

wherein,

R^1 is a member selected from H, OH, and (=O); and

R^9 is a member selected from alkyl and substituted alkyl groups.

41. The immunogenic conjugate according to claim **40**, wherein the target component has the structure:

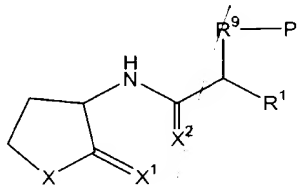


(XI)

wherein,

m is a number from 0 to 30, inclusive.

42. The immunogenic conjugate according to claim **39** having the structure:



wherein,

R^1 is a member selected from —H, —OH, and (=O);

R^9 is a member selected from alkyl groups and substituted alkyl groups;

X is a member selected from —O—, —S— and —NH—;

X^1 and X^2 are members independently selected from O and S; and

P is a protein carrier.

43. The immunogenic conjugate according to claim **42**, wherein the protein carrier has a molecular weight of greater than or equal to 5000 daltons.

44. The immunogenic conjugate according to claim **43**, wherein the protein carrier is a member selected from albumin and hemocyanin.

45. The immunogenic conjugate according to claim **39**, wherein R^9 comprises a spacer moiety situated between the target component and the protein carrier.

46. The immunogenic conjugate according to claim **45**, wherein the spacer moiety is selected from C_6-C_{30} alkyl groups, C_6-C_{30} substituted alkyl groups, polyols, polyethers, polyamines, polyamino acids, polysaccharides and combinations thereof.

47. The immunogenic conjugate according to claim **45**, wherein the spacer moiety comprises a cleavable moiety.

48. The immunogenic conjugate according to claim **47**, wherein the cleavable moiety is cleaved by a member selected from light, heat, oxidation, reduction, enzymatic action, hydrolysis and combinations thereof.

49. The immunogenic conjugate according to claim **48**, wherein the cleavable moiety is a member selected from disulfides and esters.

50. A pharmaceutical formulation comprising the immunogenic conjugate according to claim **39** and a pharmaceutically acceptable carrier.

51. The pharmaceutical formulation according to claim **50**, wherein the pharmaceutical formulation is a vaccine effective for preventing or reducing microbial infection in a subject to whom the vaccine is administered.

52. An antibody that binds specifically to the immunogenic conjugate according to claim **39**.

53. An isolated nucleic acid encoding the antibody according to claim **52**.

54. The isolated nucleic acid according to claim **53**, further comprising a promoter operably linked to the nucleic acid sequence encoding the antibody.

55. An expression vector comprising the nucleic acid according to claim **53**.

56. A host cell comprising the expression vector according to claim **55**.

57. The antibody according to claim **52**, further comprising a member selected from detectable labels, biologically active agents and combinations thereof covalently attached to the antibody.

58. The antibody according to claim **57**, wherein the detectable label is a member selected from the group consisting of radioactive isotopes, fluorescent agents, fluorescent agent precursors, chromophores, enzymes and combinations thereof.

59. The antibody according to claim **58**, wherein the biologically active agent is a member selected from antibiotics, immune stimulators and combinations thereof.

60. A pharmaceutical formulation comprising the antibody according to claim **52** and a pharmaceutically acceptable carrier.

61. A method for treating or preventing a disease in a subject caused by a microorganism, the method comprising administering to the subject an amount of the antibody according to claim **52** effective to reduce or prevent the disease state.

62. A method for treating or preventing a disease in a subject caused by a microorganism, the method comprising administering to the subject an amount of the vaccine according to claim **51** effective to reduce or prevent the disease state.

63. A method for treating or preventing a disease in a subject caused by a microorganism, the method comprising administering to the subject an amount of the immunogenic conjugate according to claim **39** effective to reduce or prevent the disease state.

64. The method according to claim **61**, wherein the disease is a microbial infection.

65. The method according to claim **62**, wherein said microbial infection accompanies cystic fibrosis.

66. The method according to claim **74**, wherein said microbial infection has a causative agent comprising P. *aeruginosa*.

67. A method for preventing or disrupting the formation of a biofilm, the method comprising contacting a microbial culture capable of forming a biofilm with an antibody according to claim **52**.

68. The method according to claim **67**, wherein said biofilm comprises P. *aeruginosa*.

69. The method according to claim **67**, wherein said biofilm is associated with an implanted medical device.

70. The method according to claim **67**, wherein said biofilm is associated with an organ *in vivo*.

71. A method for controlling autoinducer responsive gene expression in a microorganism, the method comprising contacting the microorganism with an antibody according to claim **52** effective to control said gene expression.

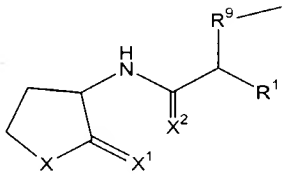
72. A method for controlling autoinducer responsive gene expression in a microorganism, the method comprising contacting the microorganism with an antibody according to claim **51** effective to control said gene expression.

73. A method for controlling autoinducer responsive gene expression in a microorganism, the method comprising contacting the microorganism with an antibody according to claim **39** effective to control said gene expression.

74. The method according to claim **71**, wherein the microorganism is bacteria.

75. The method according to claim **74**, wherein said bacteria is P. *aeruginosa*.

76. A library of compounds comprising a structure according to Formula I:



(IX)

wherein,

R^1 is a member selected from —H, —OH, and (=O);

R^9 is a member selected from alkyl groups and substituted alkyl groups;

X is a member selected from —O—, —S— and —NH—;

X^1 and X^2 are members independently selected from O and S, the library comprising a first compound according to Formula I and a second compound according to Formula I, wherein the first compound differs from the second compound in the identity of a member selected from R^1, R^9, X, X^1, X and combinations thereof.

77. The library according to claim **76**, comprising at least 10 compounds.

78. The library according to claim **77**, comprising at least 100 compounds.

79. The library according to claim **78** comprising at least 1000 compounds.

80. The library according to claim **79** comprising at least 100,000 compounds.

81. A method of detecting an autoinducer in a sample, the method comprising the steps of:

(a) contacting the sample with an antibody that specifically binds to the autoinducer; and

(b) determining whether the sample contains the autoinducer, thereby detecting said autoinducer.

82. The method of claim **81**, wherein the antibody is a monoclonal antibody.

83. The method of claim **81**, wherein the antibody is a polyclonal antibody.

84. The method of claim **81**, wherein the step of determining whether the sample contains an autoinducer comprises detecting the antibody in an assay selected from the group consisting of an ELISA assay, a western blot, an immunohistochemical assay, an immunofluorescence assay, and a real time imaging assay.

85. The method of claim **81**, wherein the step of determining whether the sample contains an autoinducer further comprises quantitating the amount of autoinducer in the sample.

86. The method of claim **81**, wherein the antibody is bound to a solid substrate.

87. The method of claim **81**, wherein the sample is selected from the group consisting of a cultured cell, and a patient sample.

88. The method of claim **87**, wherein the patient sample is a blood sample.

89. The method of claim **87**, wherein the patient sample is from a human patient.

90. The method of claim **81**, wherein the antibody is covalently linked to a detectable moiety.

91. The method of claim **90**, wherein the antibody is covalently linked to a member selected from a biotin moiety, a radioactive moiety, an enzyme moiety and combinations thereof.

92. A method of monitoring the amount of autoinducer in a patient treated with an agent that inhibits the growth of an organism producing the autoinducer, the method comprising:

(a) providing a sample from the patient treated with the growth inhibiting agent;

(b) contacting the sample with an antibody that specifically binds to an autoinducer; and

(c) determining the amount of autoinducer in the patient sample by detecting the antibody and comparing the amount of antibody detected in the patient sample to a standard curve, thereby monitoring the amount of autoinducer in the patient.

93. The method of claim **92**, further comprising the step of adjusting the dose of the growth inhibiting agent administered to the patient.

94. The method of claim **92**, wherein the sample is a blood sample.

95. The method according to claim **94**, wherein said blood sample is derived from a patient having cystic fibrosis and an infection comprising P. *aeruginosa*.

96. The method of claim **92**, wherein the antibody is a monoclonal antibody.

97. The method according to claim **92**, wherein said antibody is a polyclonal antibody.

98. The method of claim **92**, wherein the antibody is covalently linked to a detectable moiety.

99. The method of claim **98**, wherein the antibody is covalently linked to a member selected from a biotin moiety, a radioactive moiety, an enzyme moiety and combinations thereof.

100. The method of claim **92**, wherein the antibody is bound to a solid substrate.

101. A method of isolating an autoinducer, the method comprising the steps of:

(a) providing a sample comprising the autoinducer;

(b) contacting the sample with an antibody that specifically binds to the autoinducer, thereby forming an autoinducer-antibody complex; and

(c) isolating the autoinducer-antibody complex by isolating the antibody.

102. The method of claim **101**, wherein the antibody is a monoclonal antibody.

103. The method of claim **101**, wherein the antibody is covalently linked to member selected from a biotin moiety, a radioactive moiety, an enzyme moiety and combinations thereof.

104. The method of claim **101**, wherein the antibody is bound to a solid substrate.

105. A method of detecting an antibody that specifically binds to an autoinducer, the method comprising the steps of:

(a) providing a sample;

(b) contacting the sample with a peptide that specifically binds to the antibody; and

(c) detecting the antibody.

106. The method of claim **105**, wherein the step of detecting the antibody comprises an ELISA assay.

107. The method of claim **105**, wherein the peptide is bound to a solid substrate.

108. A kit for detecting an autoinducer in a sample, the kit comprising:

(a) an antibody that binds specifically to the autoinducer;

(b) directions for using the antibody to detect the autoinducer.